

GROUP 14

COOLING SYSTEM

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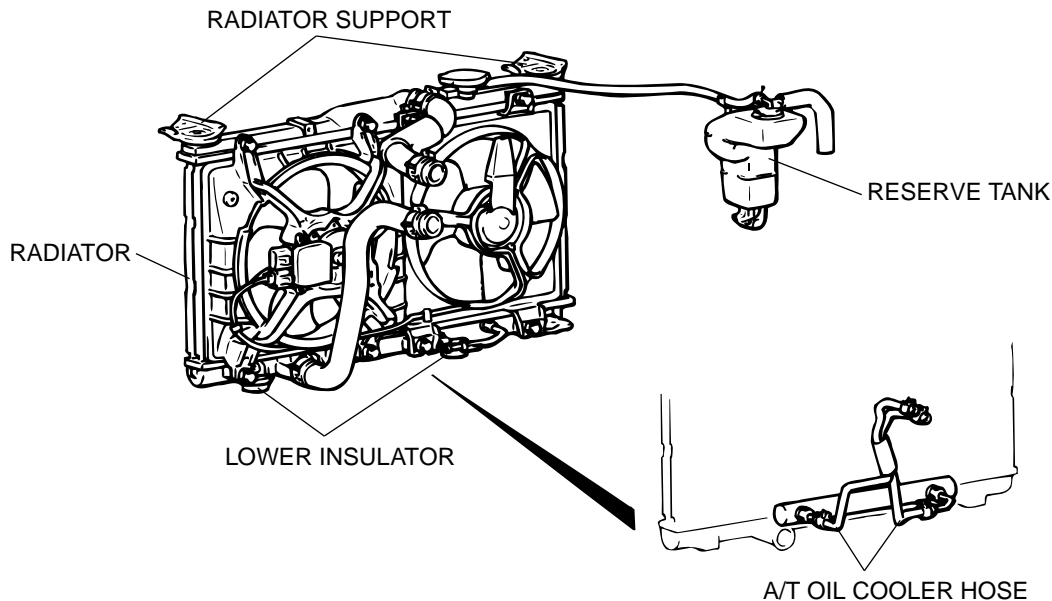
GENERAL DESCRIPTION

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The cooling system is designed to keep every part of the engine at appropriate temperature in whatever condition the engine may be operated. The cooling method is of the water-cooled, pressure forced circulation type in which the water pump pressurizes coolant and circulates it throughout the engine. If the coolant temperature exceeds the prescribed temperature, the thermostat opens to circulate the coolant through the radiator as well so that the heat absorbed by the coolant may be radiated into the air.

The water pump is of the centrifugal type and is driven by the drive belt from the crankshaft. The radiator is the corrugated fin, down flow type and is cooled by an electrical radiator fan. And if the engine coolant temperature reaches 110°C(230°F) or higher, the radiator fan control rotates the radiator fan for up to 5 minutes even after the ignition switch is turned to the "LOCK (OFF)" position [the fan stops its rotation when the engine coolant temperature decreases to 110°C (230°F) or lower].

CONSTRUCTION DIAGRAM



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ENGINE COOLING DIAGNOSIS

INTRODUCTION TO ENGINE COOLING DIAGNOISIS

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The system cools the engine so that it does not overheat and maintains the engine at an optimum temperature. The system components are the radiator, water pump, thermostat, condenser fan assembly. Possible faults include low coolant, contamination, belt loosening and component damage.

TROUBLESHOOTING STRATEGY

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Use these steps to plan your diagnostic strategy. If you follow them carefully, you will be sure that you have exhausted most of the possible ways to find an engine cooling fault.

1. Gather information from the customer.
2. Verify that the condition described by the customer exists.
3. Find and repair the malfunction by following the SYMPTOM CHART.
4. Verify that the malfunction is eliminated.

SYMPTOM CHART

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SYMPTOMS	INSPECTION PROCEDURE	REFERENCE PAGE
Coolant leak	1	P.14-4.
Engine overheating	2	P.14-4.
Radiator fan and condenser fan do not operate	3	P.14-6.
Radiator fan and condenser fan do not change speed or stop	4	P.14-13.
Radiator fan does not operate	5	P.14-15.
Condenser fan does not operate	6	P.14-16.

SYMPTOM PROCEDURES

INSPECTION PROCEDURE 1: Coolant Leak

DIAGNOSIS

STEP 1. Check for coolant leaks.

⚠ WARNING

When pressure testing the cooling system, slowly release cooling system pressure to avoid getting burned by hot coolant.

⚠ CAUTION

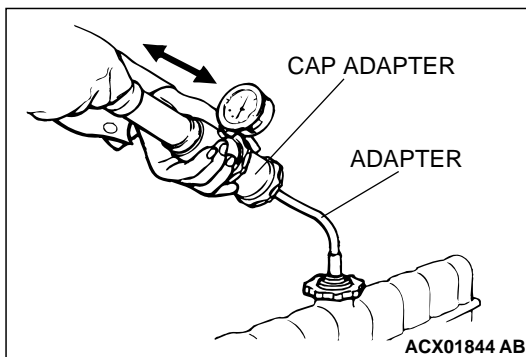
- Be sure to completely clean away any moisture from the places checked.
- When the tester is removed, be careful not to spill any coolant from it.
- When installing and removing the tester and when testing, be careful not to deform the filler neck of the radiator.

Check that the coolant level is up to the filler neck. Install a radiator cap tester and apply 160 kPa (23 psi) pressure, and then check for leakage from the radiator hose or connections.

Q: Is leakage present from the radiator hose or connections?

YES : Repair or replace the appropriate part, then go to Step2.

NO : There is no action to be taken.



STEP 2. Check trouble symptoms.

Q: Is the trouble symptom reproduced?

YES : Return to Step 1.

NO : This diagnosis is complete.

INSPECTION PROCEDURE 2: Engine Overheating

DIAGNOSIS

STEP 1. Check for coolant contamination.

Q: Is the coolant contaminated?

YES : Replace it. Refer to GROUP 00, Maintenance Service-Engine Coolant (Change) [P.00-52](#).

NO : Go to Step 2.

STEP 2. Check symptoms.

Q: Is the radiator clogged?

YES : Return to Step 1.

NO : Go to Step 3.

STEP 3. Check the radiator cap valve opening pressure.

NOTE: Be sure that the cap is clean before testing, since rust or other foreign material on the cap seal will cause an improper reading.

(1) Use a cap adapter to attach the cap to the tester.

(2) Increase the pressure until the gauge indicator stops moving.

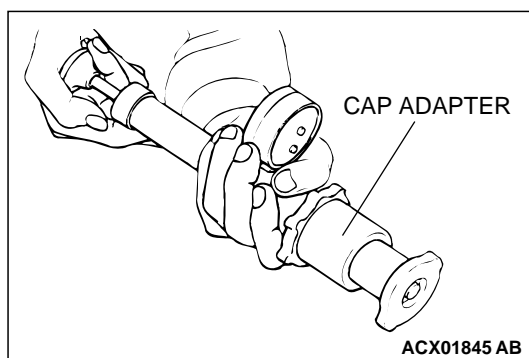
Minimum limit: 64 kPa (9.2 psi)

Standard value: 73 – 103 kPa (11 – 15 psi)

Q: Does the reading remain at or above the minimum limit?

YES : Go to Step 4.

NO : Replace the radiator cap. Then go to Step 6.



STEP 4. Check thermostat operation.

Refer to [P.14-22](#).

Q: Does the thermostat operating correctly?

YES : Go to Step 5.

NO : Replace the thermostat, then go to Step 6.

STEP 5. Check the drive belt for loosening or damage.

Refer to GROUP 00, Maintenance Service – Drive Belts (Check Condition) [P.00-40](#).

Q: Is the drive belt loose or damaged?

YES : Adjust or replace the drive belt, then go to Step 6.

NO : There is no action to be taken.

STEP 6. Check trouble symptoms.

Q: Is the coolant temperature abnormally high?

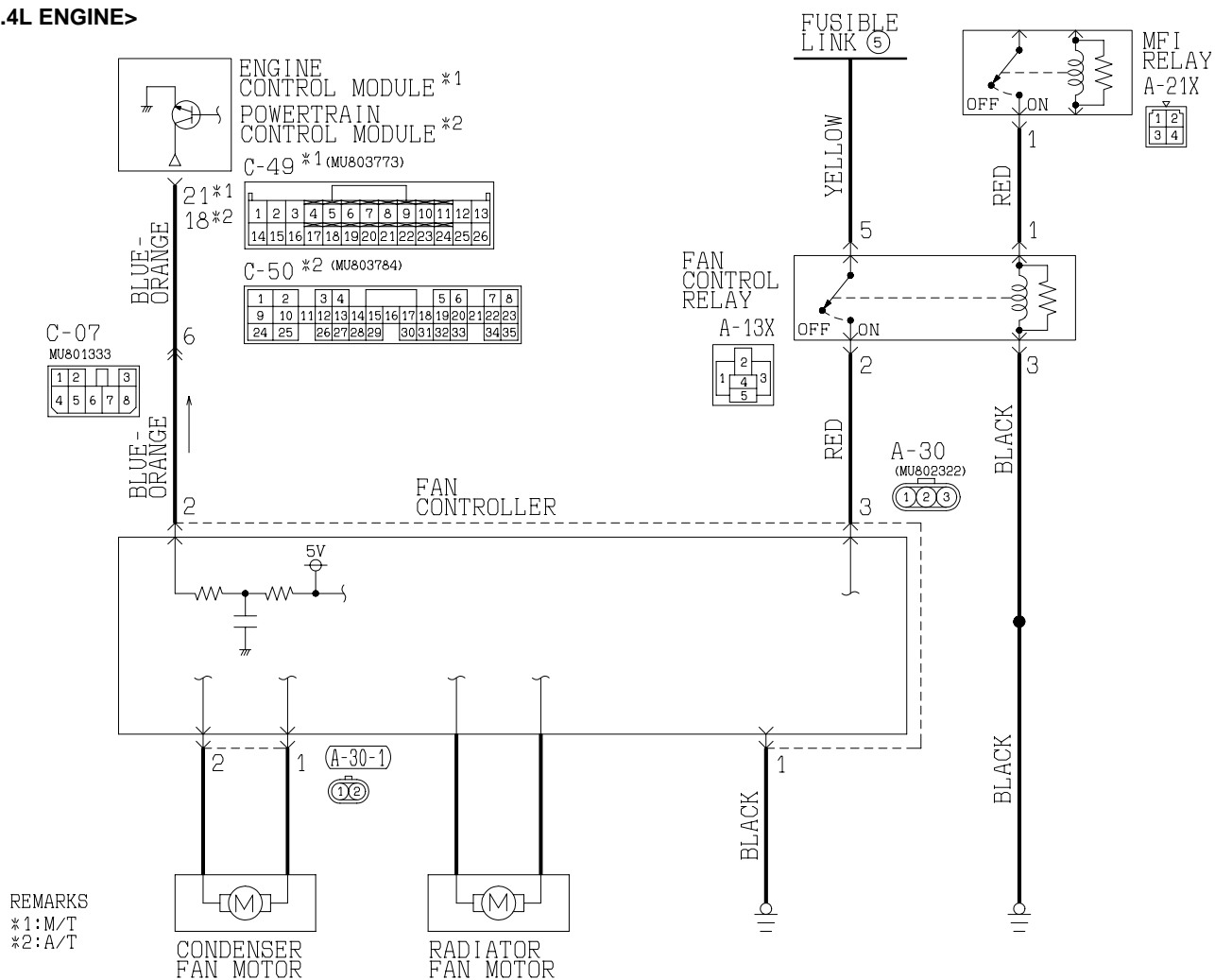
YES : Return to Step 3.

NO : This diagnosis is complete.

INSPECTION PROCEDURE 3: Radiator Fan and Condenser Fan do not Operate

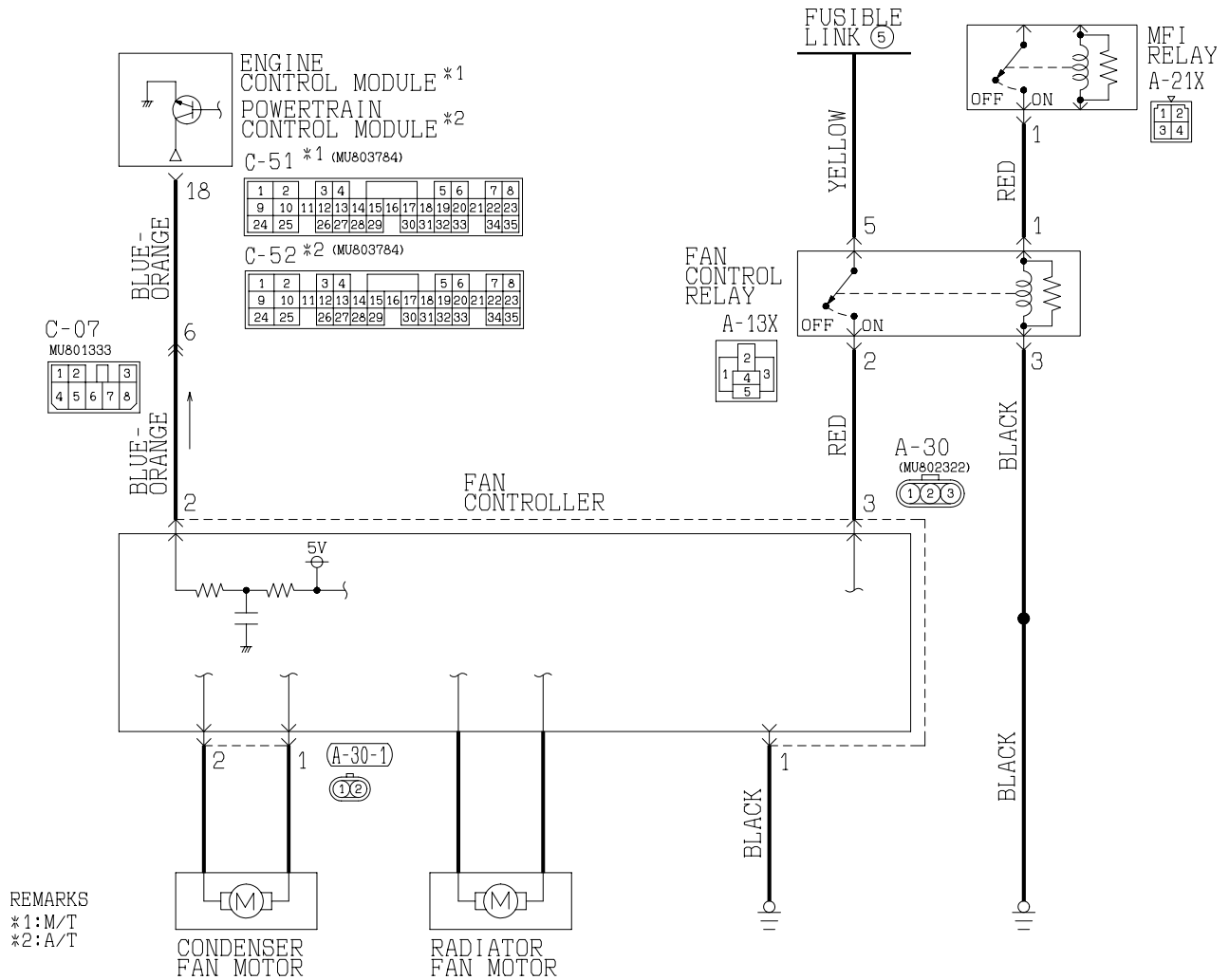
Radiator Fan and Condenser Drive Circuit

<2.4L ENGINE>

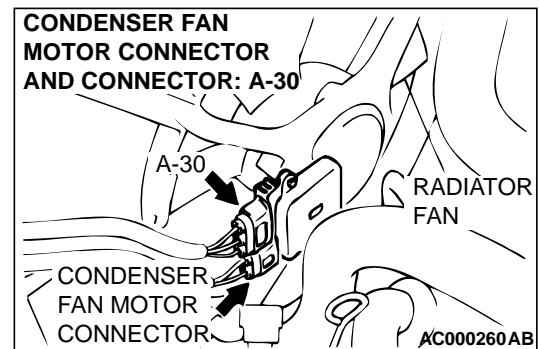
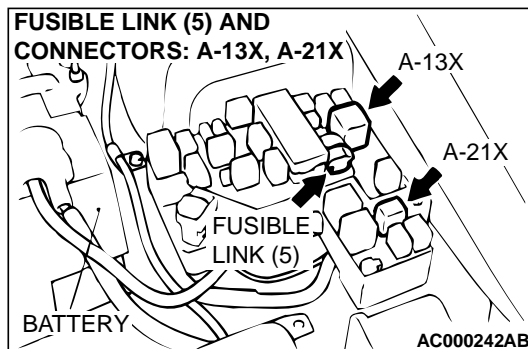


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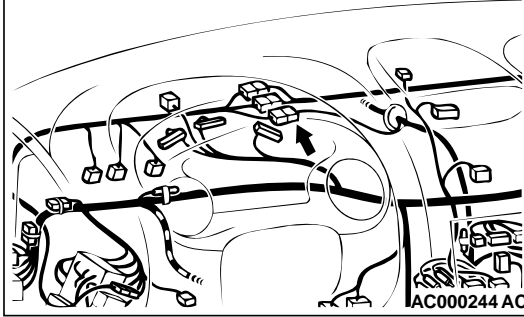
<3.0L ENGINE>



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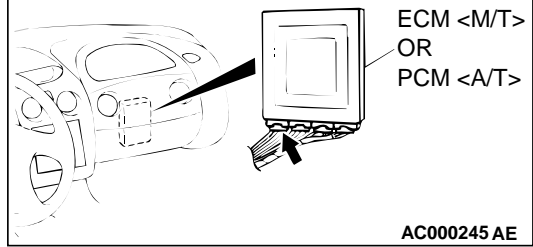


CONNECTOR: C-07



CONNECTOR:

C-49 <2.4L-M/T>, C-50 <2.4L-A/T>
C-51 <3.0L-M/T>, C-52 <3.0L-A/T>

**CIRCUIT OPERATION**

- The fan controller is powered from fusible link number 5.
- The ECM <M/T> or PCM <A/T> judges the required revolution speed of radiator fan motor and condenser fan motor using the input signals transmitted from A/C switch, automatic compressor controller, vehicle speed sensor and engine coolant temperature sensor. The ECM <M/T> or PCM <A/T> activates the fan controller to drive the radiator fan motor and condenser fan motor.

TECHNICAL DESCRIPTION

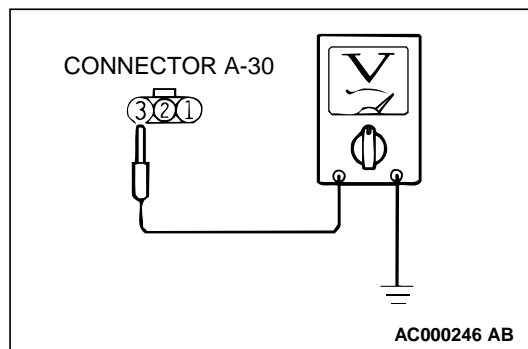
- The cause could be a malfunction of the fan controller power supply or ground circuit.
- The cause could also be a malfunction of the fan controller or the ECM <M/T> or PCM <A/T>.

TROUBLESHOOTING HINTS

- Malfunction of fusible link
- Malfunction of fan control relay
- Malfunction of fan controller
- Malfunction of ECM <M/T> or PCM <A/T>
- Damaged wiring harness or connector

DIAGNOSIS

Required Special Tool:
MB991223: Harness Set

**STEP 1. Check the circuit at fan controller connector A-30.**

- (1) Disconnect fan controller connector A-30, and measure at the harness side connector.
- (2) Measure the voltage between terminal number 3 and ground.
 - When the ignition switch is turned to "ON" position, voltage should be battery positive voltage.

Q: Is the voltage battery positive voltage when the ignition switch is turned to "ON" position?

YES : Go to Step 7.

NO : Go to Step 2.

STEP 2. Check the fan control relay.

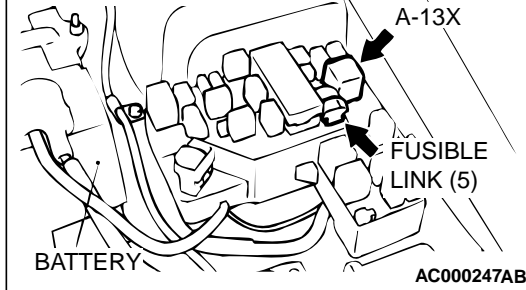
Refer to [P.14-18](#).

Q: Is the fan control relay in good condition?

YES : Go to Step 3.

NO : Replace it, then go to Step 10.

**FUSIBLE LINK (5) AND
CONNECTOR: A-13X**



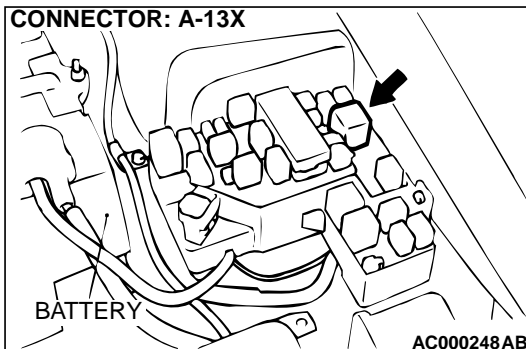
STEP 3. Check for continuity between fusible link number 5 and fan control relay connector A-13X.

Q: Are the harness wires between fusible link number 5 and fan control relay connector A-13X damaged?

YES : Repair or replace them, then go to Step 12.

NO : Go to Step 4.

CONNECTOR: A-13X



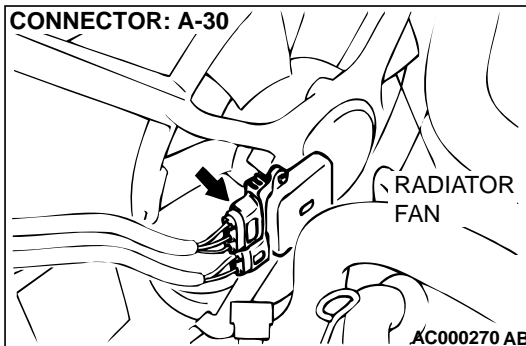
STEP 4. Check for continuity between fan control relay connector A-13X and fan controller connector A-30.

Q: Are the harness wires between fan control relay connector A-13X and fan controller connector A-30 damaged?

YES : Repair or replace them, then go to Step 12.

NO : Go to Step 5.

CONNECTOR: A-30



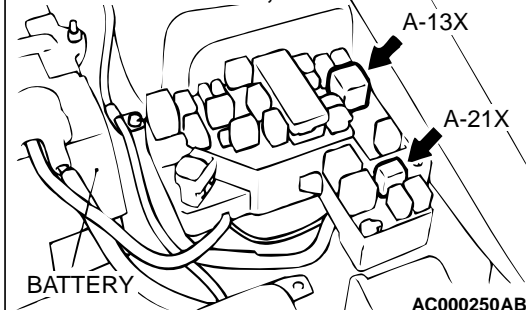
STEP 5. Check for continuity between MFI relay connector A-21X and fan control relay connector A-13X.

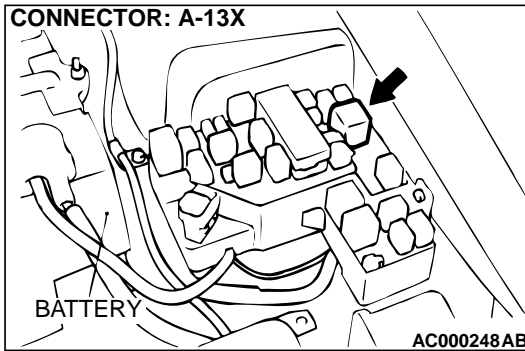
Q: Are the harness wires between MFI relay connector A-21X and fan control relay connector A-13X damaged?

YES : Repair or replace them, then go to Step 12.

NO : Go to Step 6.

CONNECTORS: A-13X, A-21X



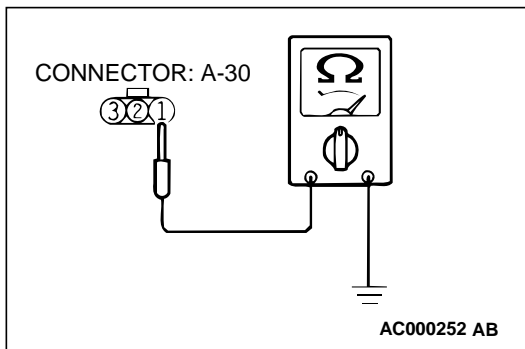


STEP 6. Check for continuity between fan control relay connector A-13X and ground.

Q: Are the harness wires between fan control relay connector A-13X and ground damaged?

YES : Repair or replace them, then go to Step 12.

NO : There is no action to be taken.



STEP 7. Check the circuit at fan controller connector A-30.

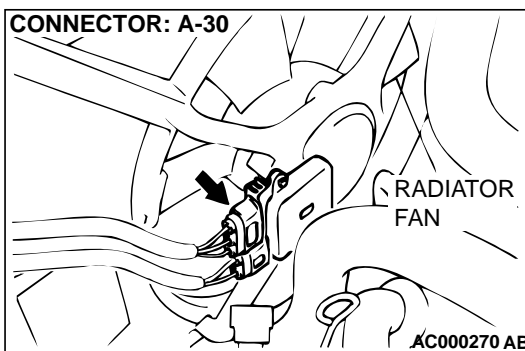
(1) Disconnect fan controller connector A-30, and measure at the harness side connector.

(2) Measure the resistance between terminal number 1 and ground.

Q: Is the resistance less than 2 ohm?

YES : Go to Step 9.

NO : Go to Step 8.

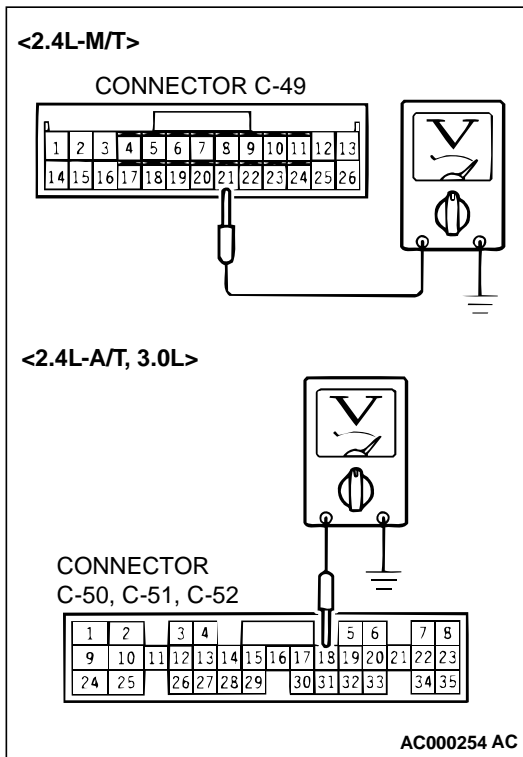


STEP 8. Check the harness wire between fan controller connector A-30 and ground.

Q: Are the harness wires between fan controller connector A-30 and ground damaged?

YES : Repair or replace them, then go to Step 12.

NO : There is no action to be taken.



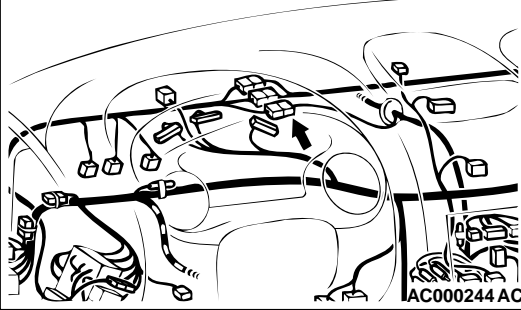
STEP 9. Check the circuit at ECM connector C-49 <2.4L-M/T>, C-51 <3.0L-M/T> or PCM connector C-50 <2.4L-A/T>, C-52 <3.0L-A/T>.

- (1) Connect ECM connector C-49 <2.4L-M/T>, C-51 <3.0L-M/T> or PCM connector C-50 <2.4L-A/T>, C-52 <3.0L-A/T>.
- (2) Start the engine and allow it to idle.
- (3) Measure the voltage between terminal number 21 <2.4L-M/T> or 18 <2.4L-A/T, 3.0L> and ground.

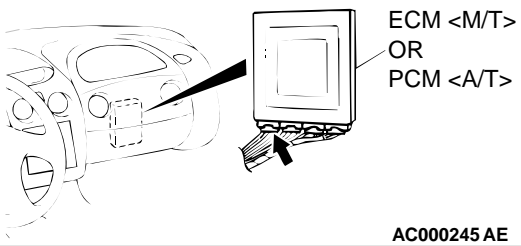
Q: Is the voltage 0.7 volt or more when the radiator fan is operating?

YES : Go to Step 11.

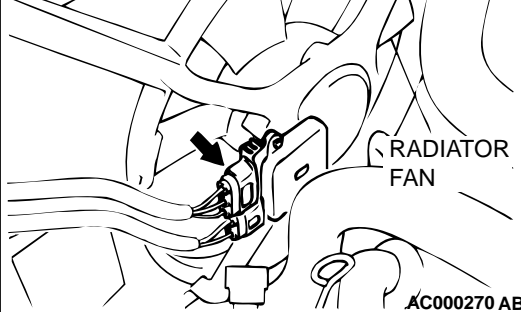
NO : Go to Step 10.

CONNECTOR: C-07**CONNECTOR:**

C-49 <2.4L-M/T>, C-50 <2.4L-A/T>
C-51 <3.0L-M/T>, C-52 <3.0L-A/T>



ECM <M/T>
OR
PCM <A/T>

CONNECTOR: A-30

RADIATOR
FAN

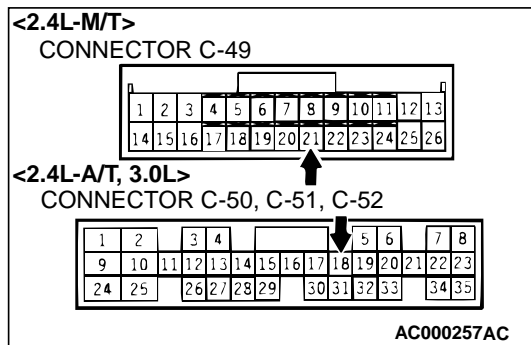
STEP 10. Check the harness wire between ECM connector C-49 <2.4L-M/T>, C-51 <3.0L-M/T> or PCM connector C-50 <2.4L-A/T>, C-52 <3.0L-A/T> and fan controller connector A-30.

NOTE: If intermediate connector C-07 is damaged, repair or replace it. Refer to GROUP 00E, Harness Connector Inspection [P.00E-2](#).

Q: Are the harness wires between ECM connector C-49 <2.4L-M/T>, C-51 <3.0L-M/T> or PCM connector C-50 <2.4L-A/T>, C-52 <3.0L-A/T> and fan controller connector A-30 damaged?

YES : Repair or replace them, then go to Step 12.

NO : Go to Step 11.



STEP 11. Check the fan control module at ECM connector C-49 <2.4L-M/T>, C-51 <3.0L-M/T> or PCM connector C-50 <2.4L-A/T>, C-52 <3.0L-A/T>.

- (1) Disconnect ECM connector C-49 <2.4L-M/T>, C-51 <3.0L-M/T> or PCM connector C-50 <2.4L-A/T>, C-52 <3.0L-A/T>.
- (2) Pull out pin 21 <2.4L-M/T> or 18 <2.4L-A/T, 3.0L> to disconnect it.
- (3) Reconnect ECM connector C-49 <2.4L-M/T>, C-51 <3.0L-M/T> or PCM connector C-50 <2.4L-A/T>, C-52 <3.0L-A/T> with pin 21 <2.4L-M/T> or 18 <2.4L-A/T, 3.0L> still removed.
- (4) Turn the ignition switch to "ON" position.

Q: Do the radiator fan motor and condenser fan motor operate?

YES : Replace the ECM <M/T> or PCM <A/T>. Then go to Step 12.

NO : Replace the radiator fan motor and fan control module assembly. Then go to Step 12.

STEP 12. Check the symptoms.

Q: Do the radiator fan and condenser fan operate correctly?

YES : This diagnosis is complete.

NO : Return to Step 1.

INSPECTION PROCEDURE 4: Radiator Fan and Condenser Fan do not Change Speed or Stop

NOTE: if the engine coolant temperature reaches 110°C (230°F) or higher, the radiator fan control rotates the radiator fan for up to 5 minutes even after the ignition switch is turned to the "LOCK (OFF)" position [the fan stops its rotation when the engine coolant temperature decreases to 110°C (230°F) or lower.]

Radiator Fan and Condenser Fan Drive Circuit

Refer to P.14-6.

CIRCUIT OPERATION

- The fan controller is powered from fusible link number 5.
- The ECM <M/T> or PCM <A/T> judges the required revolution speed of radiator fan motor and condenser fan motor using the input signals transmitted from A/C switch, automatic compressor controller, vehicle speed sensor and engine coolant temperature sensor. The ECM <M/T> or PCM <A/T> activates the fan controller to drive the radiator fan motor and condenser fan motor.

TECHNICAL DESCRIPTION

The fan controller has variable control of the radiator fan motor and the condenser fan motor speeds using signals transmitted from the ECM <M/T> or PCM <A/T>.

TROUBLESHOOTING HINTS

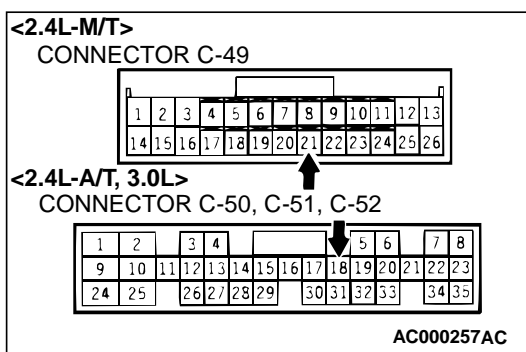
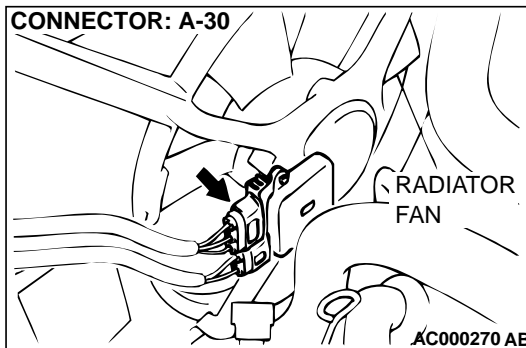
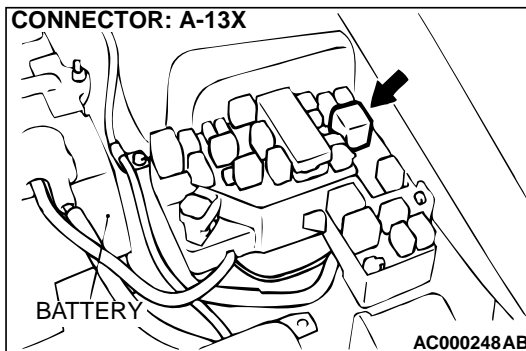
- Malfunction of fan control relay
- Malfunction of fan controller
- Malfunction of ECM <M/T> or PCM <A/T>

DIAGNOSIS

Required Special Tool:
MB991223: Harness Set

STEP 1. Check the fan control relay.

Refer to P.14-18.

Q: Is the fan control relay in good condition?**YES :** Go to Step 2.**NO :** Replace the part, then go to Step 6.**STEP 2. Check the harness wire between fan control relay connector A-13X and fan controller connector A-30.****Q: Are the harness wire between fan control relay connector A-13X and fan controller connector A-30 damaged?****YES :** Repair or replace the part, then go to Step 6.**NO :** Go to Step 3.**STEP 3. Check the circuit at ECM connector C-49 <2.4L-M/T>, C-51 <3.0L-M/T> or PCM connector C-50 <2.4L-A/T>, C-52 <3.0L-A/T>.**

- (1) Connect ECM connector C-49 <2.4L-M/T>, C-51 <3.0L-M/T> or PCM connector C-50 <2.4L-A/T>, C-52 <3.0L-A/T>.
- (2) Start the engine and run it at idle. [Engine coolant temperature: 80°C (176°F) or less]
- (3) Measure the voltage between terminal number 21 <2.4L-M/T> or 18 <2.4L-A/T, 3.0L> and ground.

Q: Is the voltage 0 – 0.3 volt when radiator fan is not operating?**YES :** Go to Step 6.**NO :** Go to Step 4.

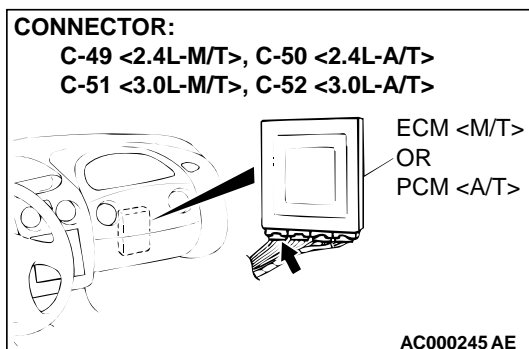
STEP 4. Check the harness wire between ECM connector C-49 <2.4L-M/T>, C-51 <3.0L-M/T> or PCM connector C-50 <2.4L-A/T>, C-52 <3.0L-A/T> and fan controller connector A-30.

NOTE: If intermediate connector C-07 is damaged, repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2.

Q: Are the harness wires between ECM connector C-49 <2.4L-M/T>, C-51 <3.0L-M/T> or PCM connector C-50 <2.4L-A/T>, C-52 <3.0L-A/T> and fan controller connector A-30 damaged?

YES : Repair or replace them, then go to Step 6.

NO : Go to Step 5.



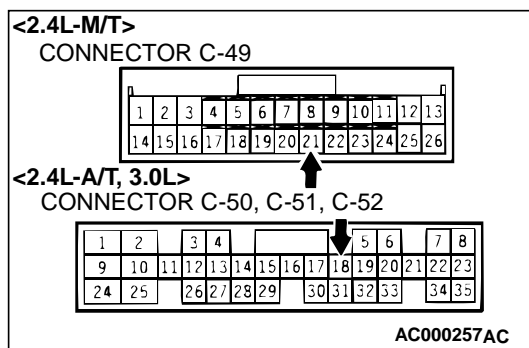
STEP 5. Check the fan controller at ECM connector C-49 <2.4L-M/T>, C-51 <3.0L-M/T> or PCM connector C-50 <2.4L-A/T>, C-52 <3.0L-A/T>.

- (1) Connect ECM connector C-49 <2.4L-M/T>, C-51 <3.0L-M/T> or PCM connector C-50 <2.4L-A/T>, C-52 <3.0L-A/T>.
- (2) Turn the ignition switch to "ON" position.
- (3) Pull out the terminal number 21 <2.4L-M/T> or 18 <2.4L-A/T, 3.0L> and connect it to the body ground.

Q: Do the radiator fan motor and condenser fan motor stop?

YES : Replace the ECM <M/T> or PCM <A/T>. Then go to Step 6.

NO : Replace the radiator fan motor and fan controller assembly. Then go to Step 6.



STEP 6. Check the symptoms.

Q: Do the radiator fan and condenser fan operate correctly?

YES : This diagnosis is complete.

NO : Return to Step 1.

INSPECTION PROCEDURE 5: Radiator Fan does not Operate

TECHNICAL DESCRIPTION

The cause could be a malfunction of the radiator fan motor or an open circuit between the fan controller and the radiator fan motor.

TROUBLESHOOTING HINTS

- Malfunction of radiator fan motor
- Malfunction of fan controller

DIAGNOSIS

Replace the radiator fan motor and fan controller assembly.

Q: Does the radiator fan operate correctly?

YES : There is no action to be taken.

NO : Repair the wiring harness between the fan controller and the radiator fan motor.

INSPECTION PROCEDURE 6: Condenser Fan does not Operate

Radiator Fan and Condenser Fan Drive Circuit

Refer to [P.14-6](#).

CIRCUIT OPERATION

- The fan controller is powered from fusible link number 5.
- The ECM <M/T> or PCM <A/T> judges the required revolution speed of radiator fan motor and condenser fan motor using the input signals transmitted from A/C switch, automatic compressor controller, vehicle speed sensor and engine coolant temperature sensor. The ECM <M/T> or PCM <A/T> activates the fan controller to drive the radiator fan motor and condenser fan motor.

TECHNICAL DESCRIPTION

The cause could be a malfunction of the condenser fan motor or of the fan controller.

TROUBLESHOOTING HINTS

- Malfunction of condenser fan motor
- Malfunction of fan controller

DIAGNOSIS

STEP 1. Check the condenser fan motor.

Refer to GROUP 55, Condenser and Condenser Fan Motor [P.55-41](#).

Q: Is the condenser fan in good condition?

YES : Replace the radiator fan motor and fan controller assembly. Then go to Step 3.

NO : Go to Step 2.

STEP 2. Check the fan controller.

Refer to [P.14-18](#).

Q: Is the fan controller in good condition?

YES : Go to Step 3.

NO : Replace the fan controller, then go to Step 3.

STEP 3. Check the symptoms.**Q: Does the condenser fan operate correctly?**

YES : This diagnosis is complete.

NO : Return to Step1.

ON-VEHICLE SERVICE

ENGINE COOLANT LEAK CHECK

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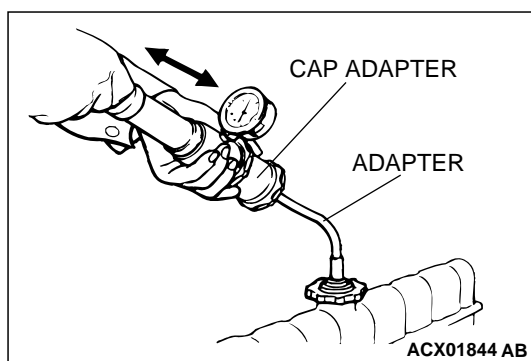
⚠ WARNING

When pressure testing the cooling system, slowly release cooling system pressure to avoid getting burned by hot coolant.

⚠ CAUTION

- Be sure to completely clean away any moisture from the places checked.
- When the tester is taken out, be careful not to spill any coolant from it.
- Be careful when installing and removing the tester and when testing not to deform the filler neck of the radiator.

1. Check that the coolant level is up to the filler neck. Install a radiator cap tester and apply 160 kPa (23 psi) pressure, and then check for leakage from the radiator hose or connections.
2. If there is leakage, repair or replace the appropriate part.



RADIATOR CAP PRESSURE CHECK

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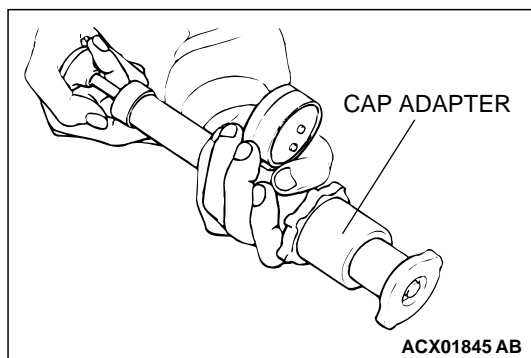
NOTE: Be sure that the cap is clean before testing, since rust or other foreign material on the cap seal will cause an improper indication.

1. Use a cap adapter to attach the cap to the tester.
2. Increase the pressure until the indicator of the gauge stops moving.

Minimum limit: 64 kPa (9.2 psi)

Standard value: 73 – 103 kPa (11 – 15 psi)

3. Replace the radiator cap if the reading does not remain at or above the limit.

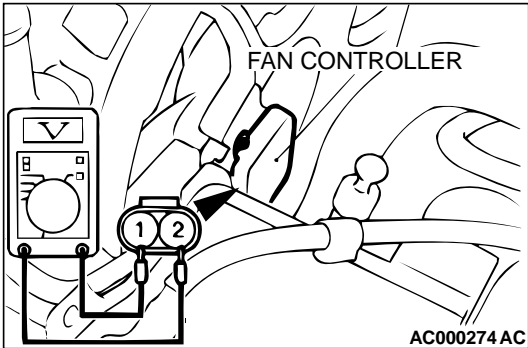


ENGINE COOLANT REPLACEMENT

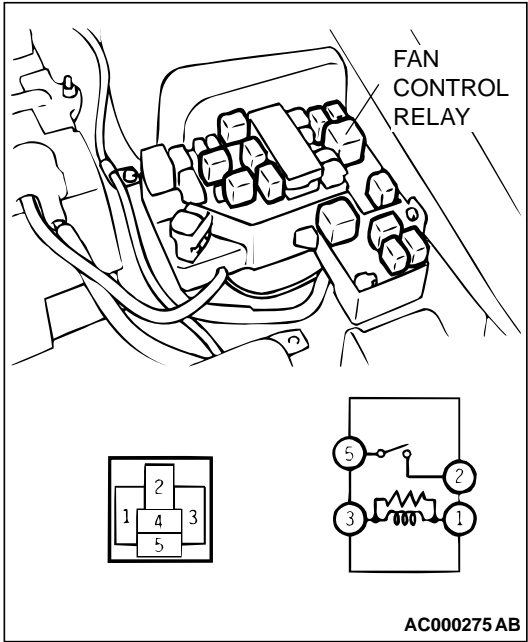
M1141001200122

Refer to GROUP 00, Maintenance Service – Engine Coolant (Change) [P.00-52](#).

ENGINE COOLANT CONCENTRATION TEST
M1141001100095
Refer to GROUP 00, RECOMMENDED LUBRICANTS AND LUBRICANT CAPACITIES TABLE P.00-32.



- FAN CONTROLLER CHECK**
M1141006100067
1. Remove condenser fan motor connector.
 2. Start the engine and run it at idle.
 3. Turn the A/C switch to ON and maintain the coolant temperature at 80°C (176°F) or less.
 4. When measuring the voltage between the fan controller-side connector terminals, check that the value changes repeatedly as indicated by (1) – (3) below.
 - (1) 0 V
 - (2) 8.2 ± 2.6 V
 - (3) Battery positive voltage ± 2.6 V
 5. If the voltage does not repeatedly change as indicated, replace the radiator fan motor and the fan controller assembly.



FAN CONTROL RELAY CONTINUITY CHECK
M1141006200064

TESTER CONNECTION	BATTERY VOLTAGE	SPECIFIED CONDITION
1 – 3	Not applied	Approximately 2Ω
2 – 5	Not applied	Open circuit
	Applied (Connect "+" to the terminal 3 and "-" to the terminal 1.)	Less than 2Ω

RADIATOR

REMOVAL AND INSTALLATION

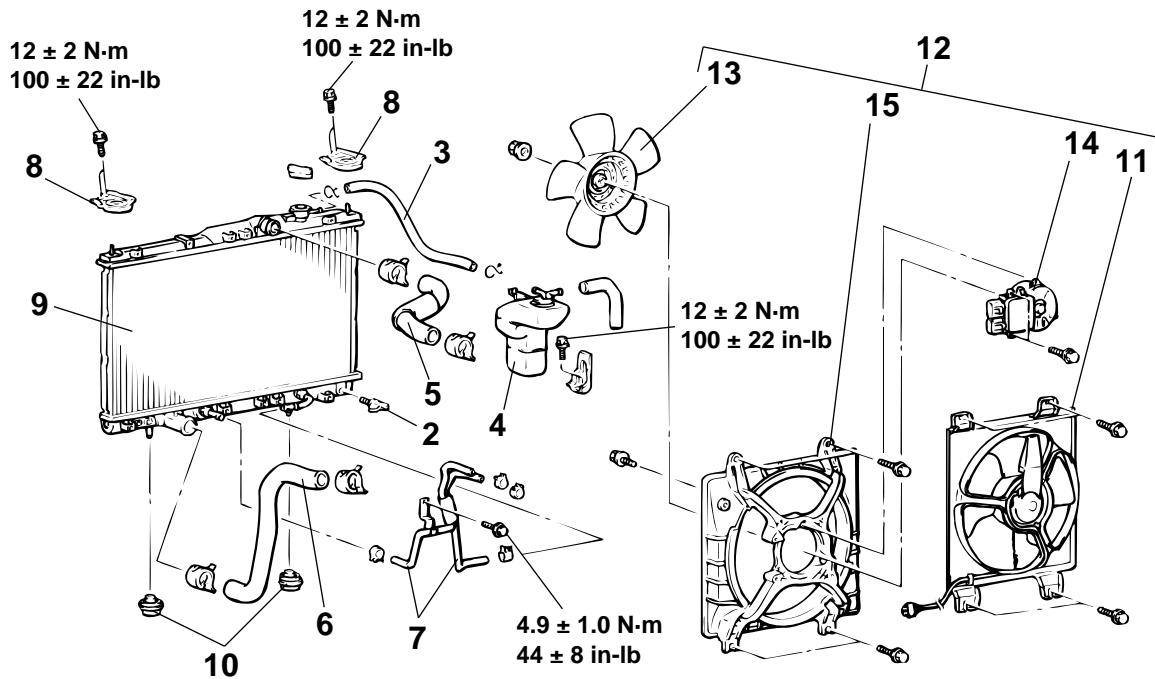
M1141001500101

Pre-removal Operation

- Engine Coolant Draining [Refer to GROUP 00, Maintenance Service – Engine Coolant (Change) P.00-52.]

Post-installation Operation

- A/T Fluid Supplying and Checking (Refer to GROUP 00, Maintenance Service – Automatic Transmission Fluid P.00-49.)
- Engine Coolant Supplying [Refer to GROUP 00, Maintenance Service – Engine Coolant (Change) P.00-52.]



AC004073 AC

RADIATOR REMOVAL STEPS

- RADIATOR CAP
- DRAIN PLUG
- RUBBER HOSE CONNECTION
- RESERVE TANK ASSEMBLY
- RADIATOR UPPER HOSE
- RADIATOR LOWER HOSE
- A/T OIL COOLER HOSE CONNECTION
- RADIATOR SUPPORT
- RADIATOR
- LOWER INSULATOR
- CONDENSER FAN MOTOR ASSEMBLY
- RADIATOR FAN MOTOR ASSEMBLY
- FAN

RADIATOR REMOVAL STEPS

- RADIATOR FAN MOTOR
- SHROUD

RADIATOR FAN MOTOR ASSEMBLY REMOVAL STEPS

- RADIATOR CAP
- DRAIN PLUG
- RADIATOR UPPER HOSE
- CONDENSER FAN MOTOR ASSEMBLY
- RADIATOR FAN MOTOR ASSEMBLY
- FAN
- RADIATOR FAN MOTOR
- SHROUD

<<A>> >>A<<
<<A>> >>A<<
<>

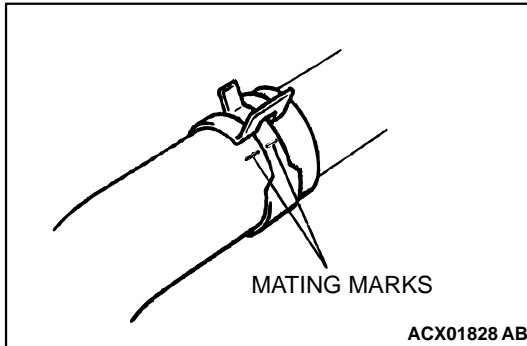
<<A>> >>A<<

REMOVAL SERVICE POINTS**<<A>> RADIATOR UPPER HOSE/RADIATOR LOWER HOSE DISCONNECTION**

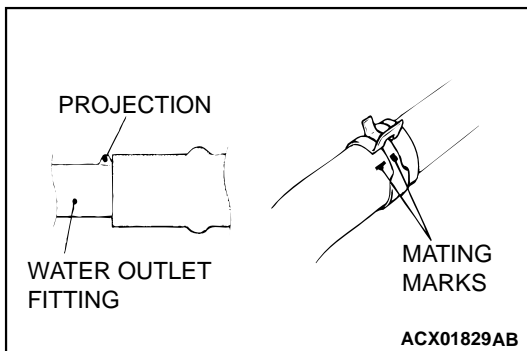
After making mating marks on the radiator hose and the hose clamp, disconnect the radiator hose.

<> A/T OIL COOLER HOSE REMOVAL

After removing the hose from the radiator, plug the hose and the radiator nipple to prevent dust or foreign particles from getting in.

**INSTALLATION SERVICE POINT****>>A<< RADIATOR LOWER HOSE/RADIATOR UPPER HOSE CONNECTION**

1. Insert each hose as far as the projection of the water inlet fitting.
2. Align the mating marks on the radiator hose and hose clamp, and then connect the radiator hose.



THERMOSTAT

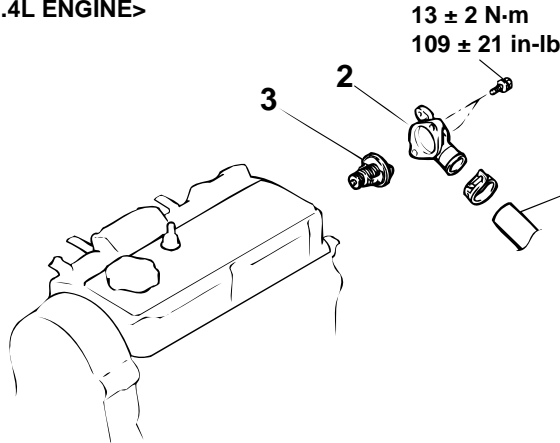
REMOVAL AND INSTALLATION

M1141002400099

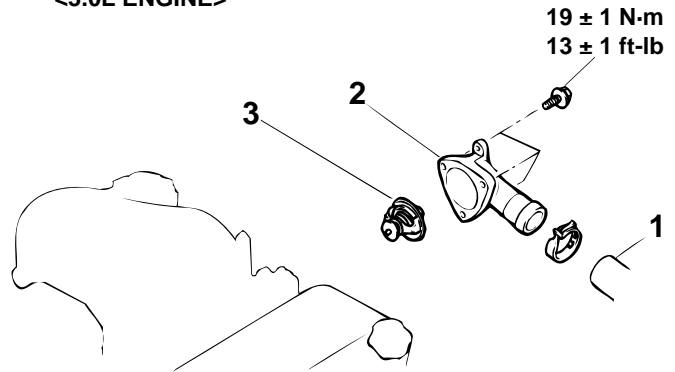
Pre-removal and Post-installation Operation

- Engine Coolant Draining and Supplying [Refer to GROUP 00, Maintenance Service - Engine Coolant (Change) [P.00-52.](#)]
- Air Cleaner Removal and Installation (Refer to GROUP 15, Air Cleaner [P.15-5.](#))

<2.4L ENGINE>



<3.0L ENGINE>



AC000278 AD

<<A>> >>B<< 1. **REMOVAL STEPS**
RADIATOR LOWER HOSE
CONNECTION

>>A<< 2. **REMOVAL STEPS (Continued)**
WATER INLET FITTING
3. THERMOSTAT

REMOVAL SERVICE POINT

<<A>> RADIATOR LOWER HOSE DISCONNECTION

Place mating marks on the radiator lower hose and hose clamp before disconnection.

INSTALLATION SERVICE POINTS

>>A<< THERMOSTAT INSTALLATION

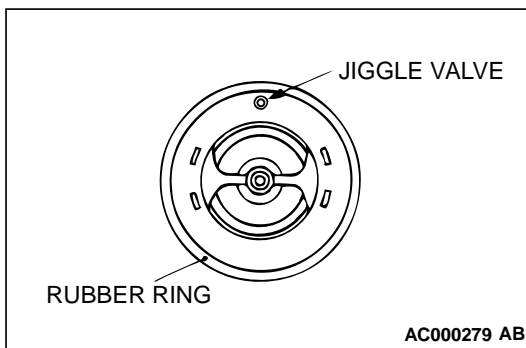
CAUTION

Make absolutely sure that no oil adheres to the rubber ring of the thermostat. Also be careful not to fold over or scratch the rubber ring when inserting.

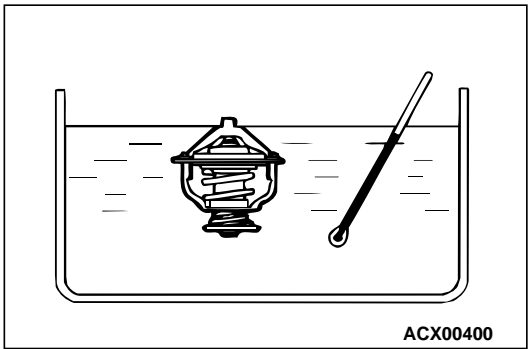
Install the thermostat so that the jiggle valve is facing straight up, while being careful not to fold over or scratch the rubber ring.

>>B<< RADIATOR LOWER HOSE CONNECTION

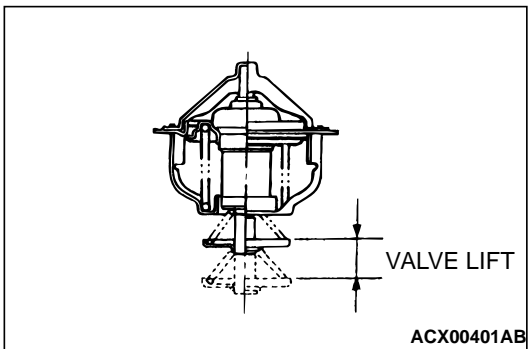
1. Insert each hose as far as the projection of the water inlet fitting.
2. Align the mating marks on the radiator hose and hose clamp, and then connect the radiator hose.



INSPECTION
THERMOSTAT CHECK



1. Immerse the thermostat in water, and heat the water while stirring. Check the thermostat valve opening temperature.
Standard value: 88 ± 1.5 °C (190 ± 3 °F)



2. Check that the amount of valve lift is at the standard value when the water is at the full-opening temperature.
NOTE: Measure the valve height when the thermostat is fully closed, and use this measurement to calculate the valve height when the thermostat is fully open.

Standard value:

ITEMS	2.4L ENGINE	3.0L ENGINE
Full-opening temperature °C (°F)	100 (212)	100 (212)
Amount of valve lift mm (in)	8.5 (0.33) or more	9.0 (0.35) or more

WATER PUMP

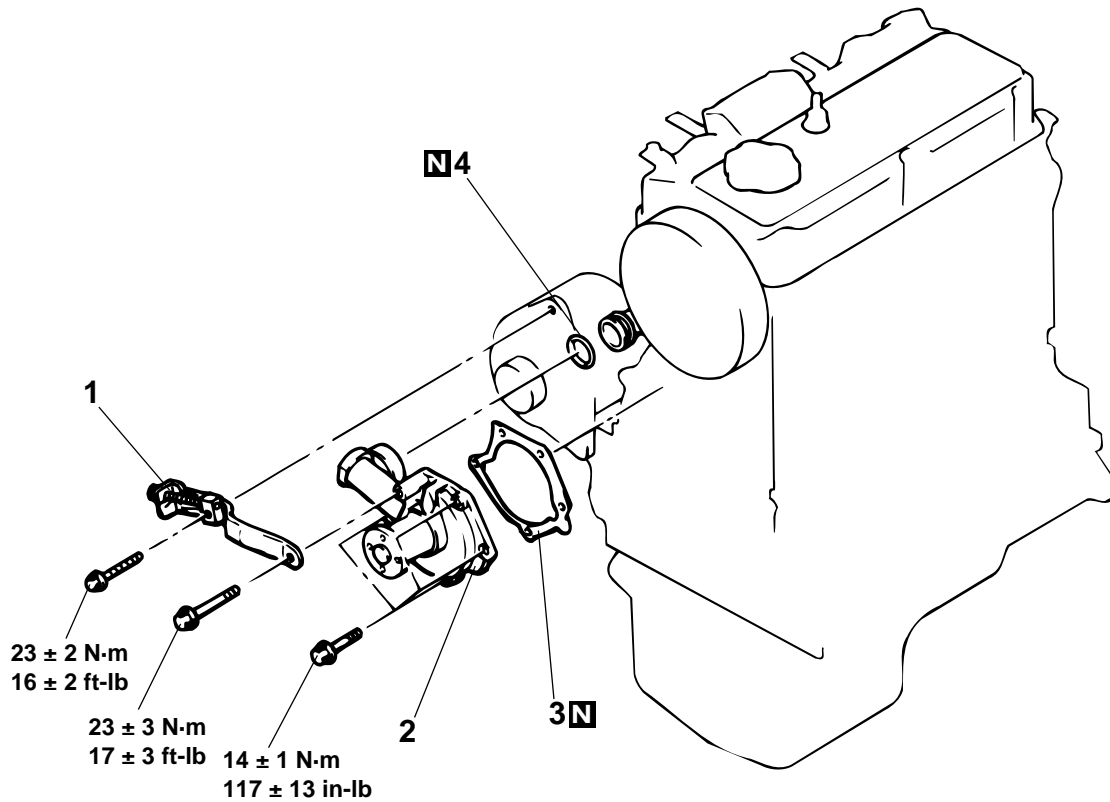
REMOVAL AND INSTALLATION

M1141002700108

<2.4L ENGINE>

Pre-removal and Post-installation Operation

- Engine Coolant Draining and Supplying [Refer to GROUP 00, Maintenance Service - Engine Coolant (Change) [P.00-52.](#)]
- Timing Belt Tensioner Pulley Removal and Installation (Refer to GROUP 11A, Timing Belt [P.11A-31.](#))



AC001549 AB

REMOVAL STEPS

- >>B<<
1. GENERATOR BRACE
 2. WATER PUMP ASSEMBLY

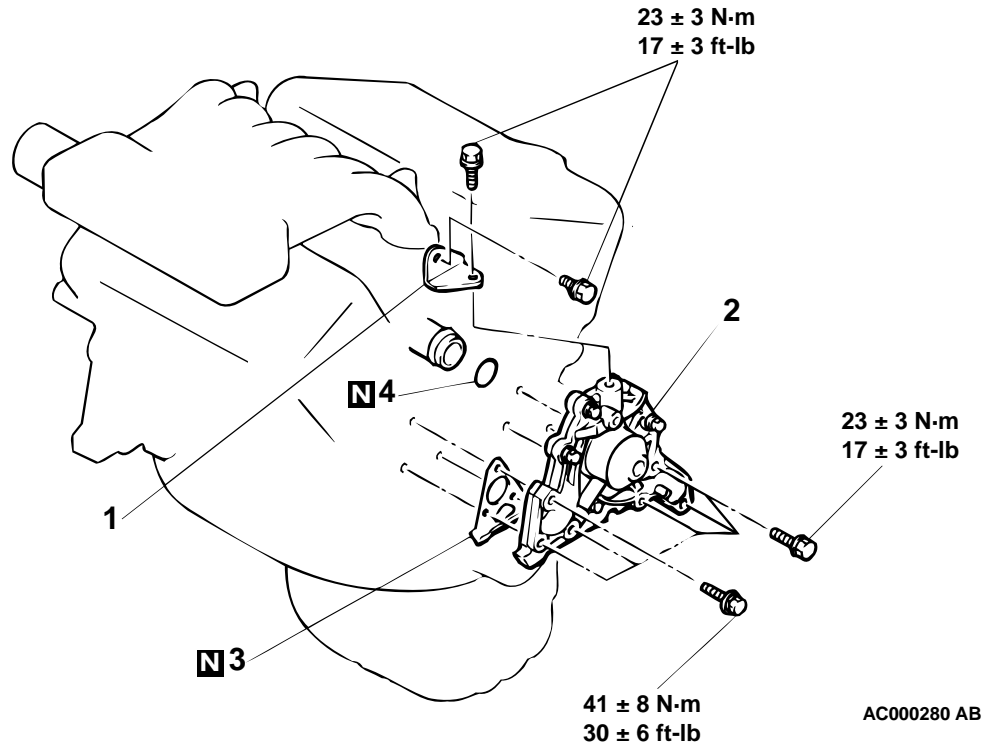
REMOVAL STEPS (Continued)

- >>A<<
3. WATER PUMP GASKET
 4. O-RING

<3.0L ENGINE>

Pre-removal and Post-installation Operation

- Engine Coolant Draining and Supplying [Refer to GROUP 00, Maintenance Service - Engine Coolant (Change) [P.00-52.](#)]
- Timing Belt Removal and Installation (Refer to GROUP 11C, Timing Belt [P.11C-32.](#))

**REMOVAL STEPS**

- THERMOSTAT (REFER TO [P.14-21.](#))
1. BRACKET

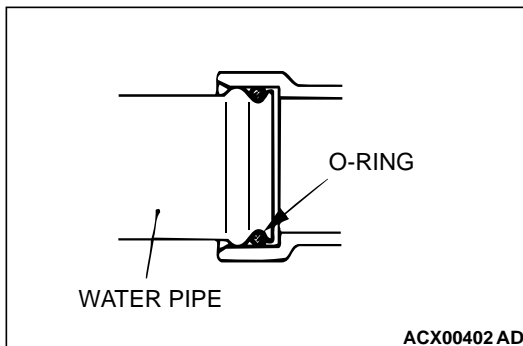
REMOVAL STEPS (Continued)

2. WATER PUMP ASSEMBLY
3. WATER PUMP GASKET
4. O-RING

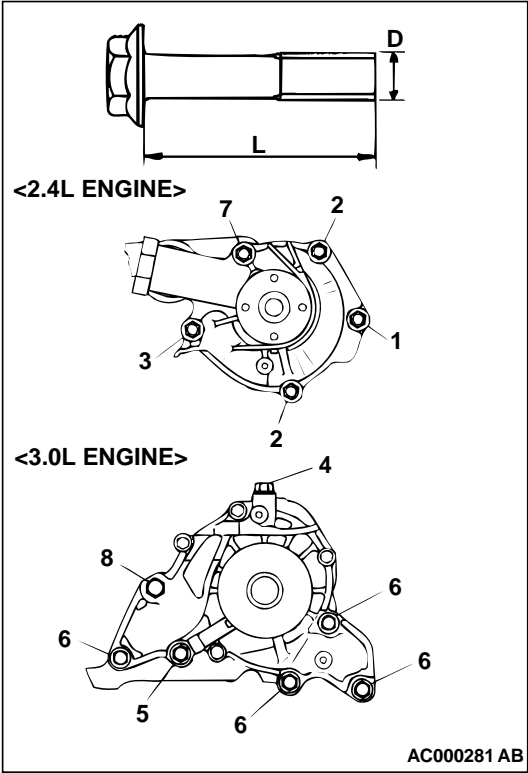
INSTALLATION SERVICE POINTS**>>A<< O-RING INSTALLATION****⚠ CAUTION**

- Care must be taken not to permit engine oil or other grease to adhere to the O-ring.
- When inserting the pipe, check to be sure that there is no sand, dirt, etc. on its inner surface.

Rinse the mounting location of O-ring and water pipe with water, and install the O-ring and water pipe.



>>B<< WATER PUMP ASSEMBLY INSTALLATION



NO.	HARDNESS CATEGORY (HEAD MARK)	BOLT DIAMETER (D) × LENGTH (L) mm (in)
1	4T	8 × 14 (0.3 × 0.6)
2		8 × 22 (0.3 × 0.9)
3		8 × 25 (0.3 × 1.0)
4	7T	8 × 14 (0.3 × 0.6)
5		8 × 20 (0.3 × 0.8)
6		8 × 25 (0.3 × 1.0)
7		8 × 60 (0.3 × 2.4)
8		10 × 38 (0.4 × 1.5)

WATER HOSE AND WATER PIPE

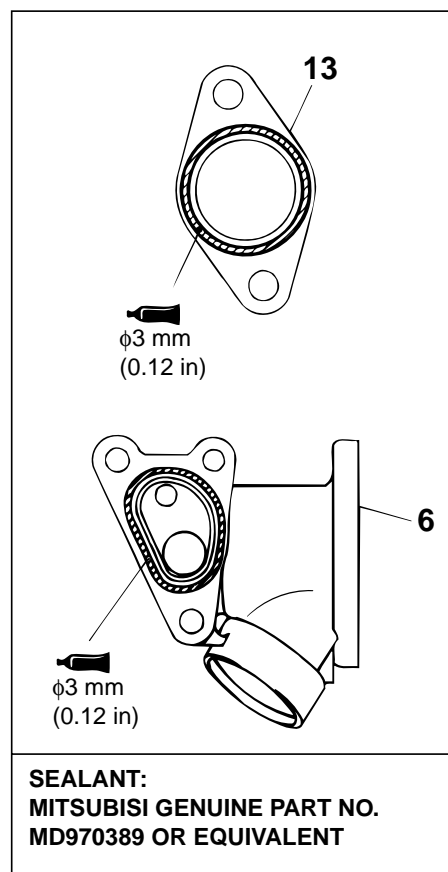
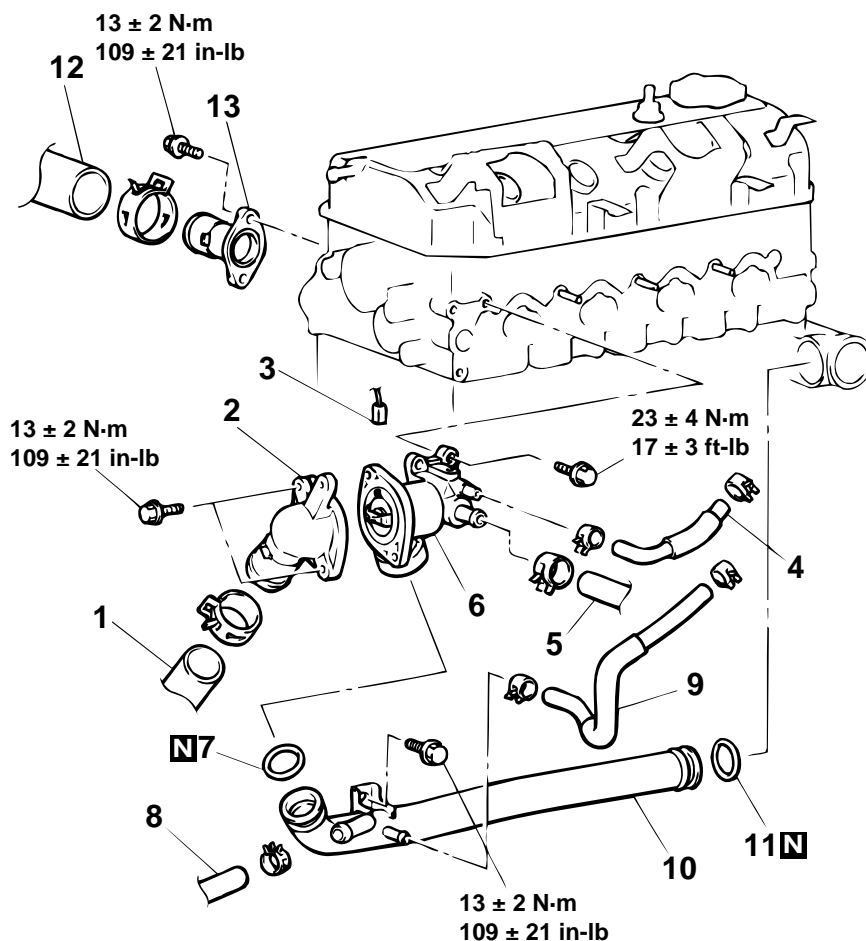
REMOVAL AND INSTALLATION

M1141003300084

<2.4L ENGINE>

Pre-removal and Post-installation Operation

- Engine Coolant Draining and Supplying [Refer to GROUP 00, Maintenance Service - Engine Coolant (Change) P.00-52.]
- Thermostat Removal and Installation (Refer to P.14-21.)
- Exhaust Manifold Removal and Installation (Refer to GROUP 15, Exhaust Manifold P.15-15.)



AC000282 AB

REMOVAL STEPS

- <<A>> >>B<<
1. RADIATOR LOWER HOSE CONNECTION
 2. WATER INLET FITTING
 3. ENGINE COOLANT TEMPERATURE GAUGE UNIT CONNECTOR
 4. WATER HOSE
 5. HEATER HOSE CONNECTION
 6. THERMOSTAT CASE ASSEMBLY
- >>A<<

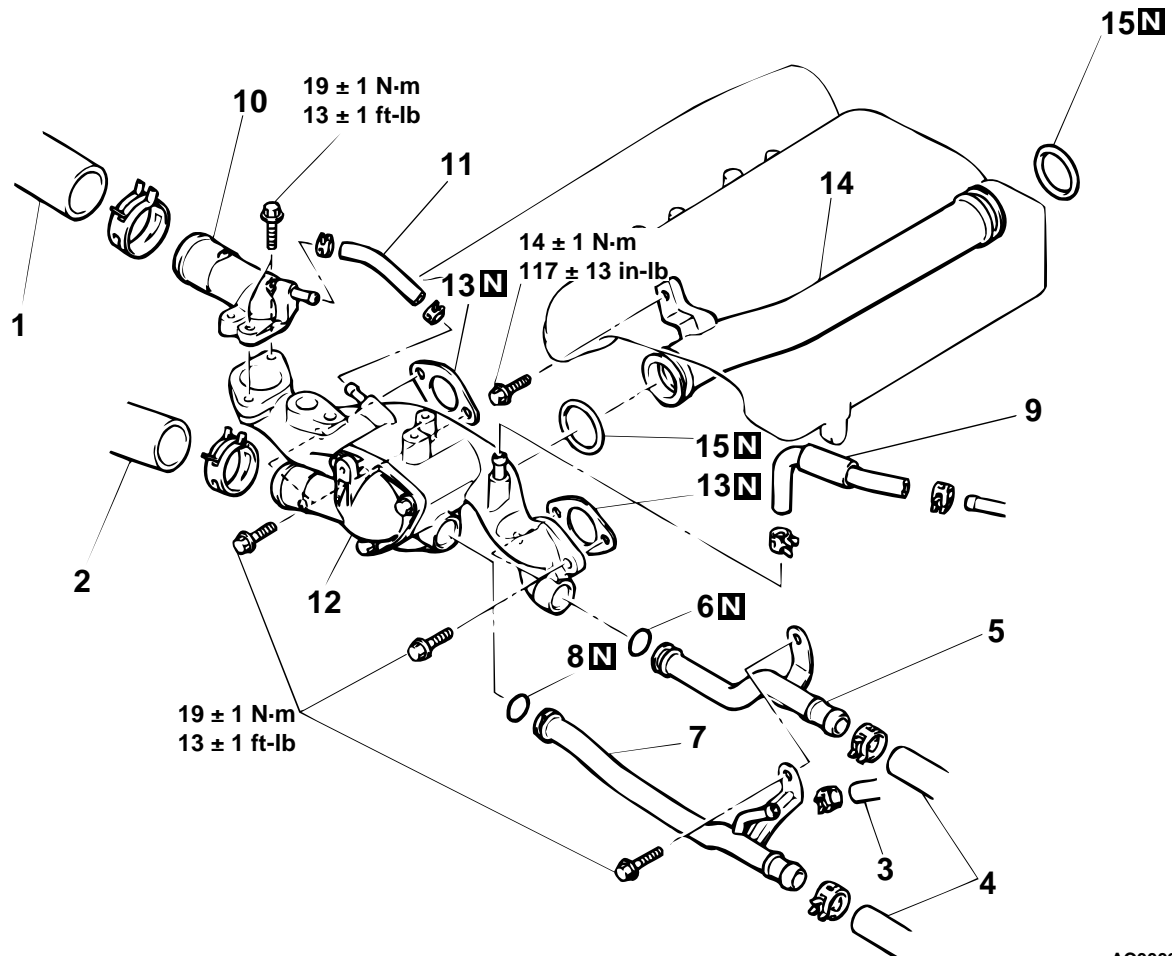
REMOVAL STEPS (Continued)

- >>C<<
7. O-RING
 8. HEATER HOSE CONNECTION
 9. WATER HOSE
 10. WATER INLET PIPE ASSEMBLY
 11. O-RING
 12. RADIATOR UPPER HOSE CONNECTION
 13. WATER OUTLET FITTING
- >>A<< >>B<< >>C<<

<3.0L ENGINE>

Pre-removal and Post-installation Operation

- Engine Coolant Draining and Supplying [Refer to GROUP 00, Maintenance Service - Engine Coolant (Change) [P.00-52.](#)]
- Intake Manifold Removal and Installation (Refer to GROUP15, Intake Manifold [P.15-12.](#))
- Thermostat Removal and Installation (Refer to [P.14-21.](#))
- Distributor Removal and Installation (Refer to GROUP 16, Distributor [P.16-50.](#))



AC000283 AB

REMOVAL STEPS

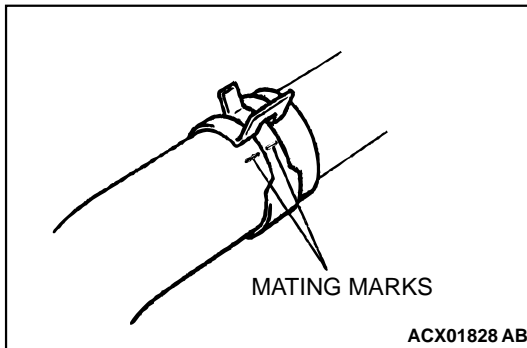
- | | | | |
|-------|-------|----|--------------------------------|
| <<A>> | >>B<< | 1. | RADIATOR UPPER HOSE CONNECTION |
| <<A>> | >>B<< | 2. | RADIATOR LOWER HOSE CONNECTION |
| | | 3. | WATER HOSE CONNECTION |
| | | 4. | HEATER HOSE CONNECTION |
| | | 5. | HEATER INLET PIPE A |
| | >>C<< | 6. | O-RING |
| | | 7. | HEATER INLET PIPE B |

REMOVAL STEPS (Continued)

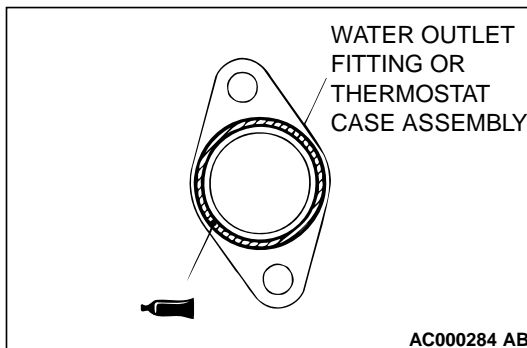
- | | | |
|-------|-----|-----------------------------|
| >>C<< | 8. | O-RING |
| | 9. | WATER HOSE |
| | 10. | WATER OUTLET FITTING |
| | 11. | WATER HOSE |
| | 12. | THERMOSTAT HOUSING ASSEMBLY |
| | 13. | GASKET |
| | 14. | WATER INLET PIPE |
| >>C<< | 15. | O-RING |

REMOVAL SERVICE POINT**<<A>> RADIATOR UPPER/LOWER HOSE
DISCONNECTION**

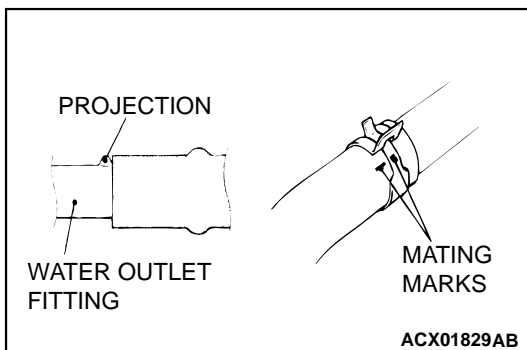
After making mating marks on the radiator hose and hose clamp, disconnect the radiator hose.

**INSTALLATION SERVICE POINTS****>>A<< WATER OUTLET FITTING <2.4L Engine>/
THERMOSTAT CASE ASSEMBLY <2.4L Engine>
INSTALLATION**

Apply a continuous bead of MITSUBISHI GENUINE Sealant Part number MD970389 or equivalent to the thermostat housing mating surface.

**>>B<< RADIATOR UPPER/LOWER HOSE CONNECTION**

1. Insert each hose as far as the projection of the water outlet fitting.
2. Align the mating marks on the radiator hose and hose clamp, and then connect the radiator hose.

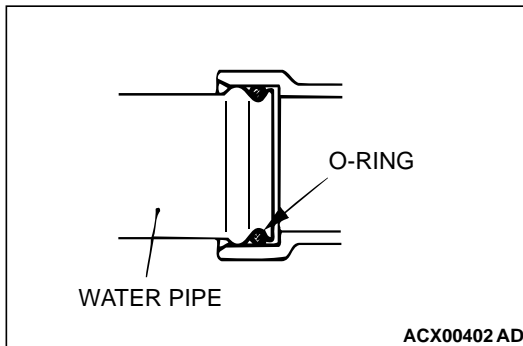


>>C<< O-RING INSTALLATION

⚠ CAUTION

Do not allow engine oil or other grease to adhere to the O-ring.

Install the O-ring to the water pipe, and coat the outer portion of the O-ring with water or engine coolant.

**INSPECTION**

M1141003400081

WATER PIPE AND HOSE CHECK

Check the water pipe and hose for cracks, damage and clogs. Replace them if necessary.

SPECIFICATIONS**FASTENER TIGHTENING SPECIFICATIONS**

M1141005000089

ITEM	SPECIFICATION
Radiator	
A/T oil cooler hose connection bolt <A/T>	$4.9 \pm 1.0 \text{ N}\cdot\text{m}$ ($44 \pm 8 \text{ in}\cdot\text{lb}$)
Radiator support bolt	$12 \pm 2 \text{ N}\cdot\text{m}$ ($100 \pm 22 \text{ in}\cdot\text{lb}$)
Reserve tank bolt	$12 \pm 2 \text{ N}\cdot\text{m}$ ($100 \pm 22 \text{ in}\cdot\text{lb}$)
Thermostat	
Water inlet fitting bolt <2.4L ENGINE>	$13 \pm 2 \text{ N}\cdot\text{m}$ ($109 \pm 21 \text{ in}\cdot\text{lb}$)
Water inlet fitting bolt <3.0L ENGINE>	$19 \pm 1 \text{ N}\cdot\text{m}$ ($13 \pm 1 \text{ ft}\cdot\text{lb}$)
Water pump <2.4L ENGINE>	
Generator bolt	$23 \pm 2 \text{ N}\cdot\text{m}$ ($16 \pm 2 \text{ ft}\cdot\text{lb}$)
Generator brace bolt	$23 \pm 3 \text{ N}\cdot\text{m}$ ($17 \pm 3 \text{ ft}\cdot\text{lb}$)
Water pump bolt	$14 \pm 1 \text{ N}\cdot\text{m}$ ($117 \pm 13 \text{ in}\cdot\text{lb}$)
Water pump <3.0L ENGINE>	
Water pump bolt	$23 \pm 3 \text{ N}\cdot\text{m}$ ($17 \pm 3 \text{ ft}\cdot\text{lb}$)
Water pump bracket bolt	$23 \pm 3 \text{ N}\cdot\text{m}$ ($17 \pm 3 \text{ ft}\cdot\text{lb}$)
Water pump gasket bolt	$41 \pm 8 \text{ N}\cdot\text{m}$ ($30 \pm 6 \text{ ft}\cdot\text{lb}$)
Water hose and water pipe <2.4L ENGINE>	
Thermostat case bolt	$23 \pm 4 \text{ N}\cdot\text{m}$ ($17 \pm 3 \text{ ft}\cdot\text{lb}$)
Water inlet fitting bolt	$13 \pm 2 \text{ N}\cdot\text{m}$ ($109 \pm 21 \text{ in}\cdot\text{lb}$)
Water inlet pipe assembly bolt	$13 \pm 2 \text{ N}\cdot\text{m}$ ($109 \pm 21 \text{ in}\cdot\text{lb}$)

ITEM	SPECIFICATION
Water outlet fitting bolt	13 ± 2 N·m (109 ± 21 in-lb)
Water hose and water pipe <3.0L ENGINE>	
Heater inlet pipe bolt	19 ± 1 N·m (13 ± 1 ft-lb)
Thermostat housing bolt	19 ± 1 N·m (13 ± 1 ft-lb)
Water inlet pipe assembly bolt	14 ± 1 N·m (117 ± 13 in-lb)
Water outlet fitting bolt	19 ± 1 N·m (13 ± 1 ft-lb)

SERVICE SPECIFICATIONS

M1141000300085

ITEMS		STANDARD VALUE	LIMIT
High-pressure valve opening pressure of radiator cap kPa (psi)		73 – 103 (11 – 15)	64 (9.2)
Thermostat	Valve opening temperature of thermostat °C (°F)		88 ± 1.5 (190 ± 3)
	Full-opening temperature of thermostat °C (°F)		100 (212)
	Valve lift mm (in)	2.4L Engine	8.5 (0.33) or more
		3.0L Engine	9.0 (0.35) or more

LUBRICANT

M1141000400060

ITEMS		QUANTITY dm ³ (qt)
Mitsubishi Genuine Coolant or equivalent	2.4L Engine	7.0 (7.4)
	3.0L Engine	8.0 (8.5)

SEALANT

M1141000500067

ITEMS	SPECIFIED SEALANT	REMARKS
Thermostat case <2.4L Engine>, Water outlet fitting <2.4L Engine>	MITSUBISHI GENUINE Part No. MD970389 or equivalent	Semi-drying sealant